In Zimbabwe, where the rural population is more dispersed than in Botswana, it became clear that a smaller dehuller would be needed. The result is a locally made machine, smaller than the Botswana model, but larger than one manufactured by artisans and used in the Gambia. In the Gambia, a modified mini-dehuller was introduced to handle small batches of grain up to 5 kilograms.

One of the latest interesting developments is the introduction of the dehuller in India, where it is the central component of a small-scale milling operation owned and managed by local women. IDRC is optimistic about the future of the abrasive disc dehuller in the food system in Africa and many other developing areas.

Notes

Based on a manuscript by M. Bassey and O. Schmidt, *The Abrasive Disc Dehuller*, to be published in 1988.

IDRC is a public corporation, created by the Parliament of Canada in 1970 to encourage and support scientific and technical research by developing countries for their own benefit. IDRC's policies are set by an international board of governors.

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An End To Pounding

Research For Simple Solutions

CANADA

History

Because of recent droughts in the Sahel and in Eastern and Southern Africa, national policymakers are taking an interest in sorghum and the millets. These traditional crops are drought-resistant and well adapted to semi-arid climates. In 1981, these crops accounted for 28% of cereal production in Africa — second only to maize — and they are preferred by a substantial percentage of the population. Their tough outer hulls create a problem, however.

Traditionally, women in Africa dehull the grains using pestle and mortar, often spending hours each day pounding the tough hulls off the grain before grinding it to produce enough flour for the family's daily meals. Until recently, no appropriate equipment existed at the village level for dehulling these African cereal grains. A solution to this problem is an abrasive disc dehuller originally designed in the early 1970s by the National Research Council's laboratory in Saskatoon, Saskatchewan, with support from the International Development Research Centre (IDRC).

In January 1987, Prime Minister Brian Mulroney announced a $3.9 million project of the Canadian International Development Agency (CIDA) to construct 40 village mills in Zimbabwe. The key element in the operation of these mills is the abrasive disc dehuller.

Simple Technology for Complex Problems

The simplicity of the dehuller belies the amount and complexity of the research involved in its development. For more than 15 years, IDRC has supported research to improve processing of traditional foods. One such project involves testing and adapting the dehuller to meet the needs of interested countries in Africa, Asia, and Latin America.

IDRC recognized the need to test the product locally and to put in place the promotional and educational programs necessary to ensure its use. The dehuller was modified in Botswana, where it has spawned a milling industry that has helped reduce the country's dependence on South Africa for its supply of flour.

Dehullers are now being manufactured in the Gambia, Senegal, and Zimbabwe as well as Botswana. Botswana exports dehullers to about 10 other African countries including South Africa. About 150 units are currently in operation. In Canada, the dehuller is manufactured by Nutana Machine Ltd in Saskatoon and an entrepreneur in Toronto also built a few dehullers to process grains and legumes desired by local clients.

The Need

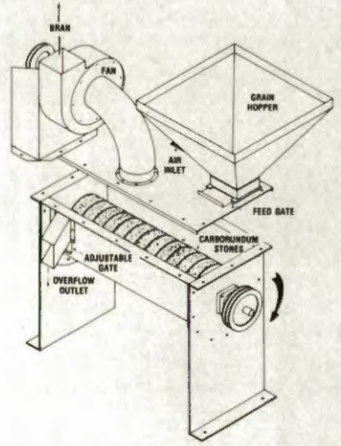
Food production in Africa requires the energies of 80% of the population, mostly subsistence farmers who cultivate small plots of land. They generally want to mill their own crop because they rarely have the cash to buy commercially milled flour; also, they prefer the traditional varieties they grow themselves. This means access to the dehuller must be easy, inexpensive, and at the village level. As well, operators must be trained to maintain and run the equipment and replacement parts must be available quickly and cheaply. Thus, the machine must be simple, rugged, and inexpensive: one that can be adapted to local needs and built locally.

How It Works

Reduction milling, which is used in making wheat flour, is impractical for tropical cereal grains and legumes because the seed coat or hull breaks up into tiny particles that cannot be separated by sifting. Millet and sorghum grains also vary greatly in size and hardness depending on the variety grown. This again makes reduction milling impractical because the gap between the rollers would have to be adjustable. Thus, the dehuller must work by abrasion, scraping off the outer coat before the grain is milled to produce flour.

The dehuller consists of a metal shaft on which a number of grinding stones, or abrasive discs, are evenly spaced about 2 centimetres apart. This rotor is enclosed in a semicircular sheet-metal barrel that is filled with grain. The abrasive discs, spinning at 1500 to 2000 revolutions per minute, rub against the freely moving mass of grain and abrade away the outer layers.

For grains of different sizes or with different thickness of seed coat, the time required to grind off the hull must be adjusted — the harder the hull, the longer the time inside the dehuller.



An aspirator vacuums away the light seed casings (the hulls) or, for small batches, a winnowing machine is used. The winnower consists of a vibrator to toss the dehulled grain into the air and a fan to blow the hulls away from the inner seed.

The Development

The starting point for this effective technology was a barley thresher modified for dehulling by the National Research Council of Canada with IDRC support. They also designed a mini-dehuller as a laboratory tool for testing the dehulling of sample grains produced by breeding programs. These became the prototypes for field tests.

Initial experiments in Nigeria demonstrated that the dehuller could be used on local sorghum, millet, maize, and cowpeas. In Botswana, the dehuller underwent sophisticated development as a complete food-processing system, including machine design, manufacture, testing, training, consumer surveys, information dissemination, and public policy formulation.

Simple but necessary improvements were made over the years. A trap door was added so grain could be removed at any time — thus, consumers could separate their personal batches. Engineers also strengthened, lightened, and simplified the dehuller. An operator's manual was produced in English and Setswana.

In the past few years, two major developments have been the transfer of the manufacturing technology to the private sector and the appearance of an export market for dehullers.

In the meantime, in Senegal, the operator of a farm-equipment factory studied the demand for mechanically dehulled grain in collaboration with Senegalese researchers. Now, an adapted version of the mini-dehuller is rolling off the assembly line at the factory.